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CLAIMS:

1. An integrated water treatment and flue gas desulfurization process comprising:

(a) subjecting a water stream containing hardness minerals to a water treatment process using an alkali agent to precipitate the hardness minerals and to produce a softened alkaline water stream; and,

(b) utilizing the softened alkaline water stream to scrub a flue gas containing sulfur dioxide to produce a sulfur-lean flue gas.

2. The process of claim 1 wherein the precipitating alkali agent is ammonia or aqueous ammonia.

3. The process of claim 1 wherein step (a) includes the addition of the group consisting of sodium carbonate, carbon dioxide, sodium hydroxide, magnesium oxide, and any combination thereof.

4. The process of claim 1 wherein the process is integrated with a steam injection bitumen recovery operation where step (b) further produces a treated water stream rich in sulfite/bisulfite for steam generation and underground steam injection and the water stream for step (a) is a produced water stream recovered from an underground reservoir.

5. The process of claim 1 wherein step (a) includes a separation process to separate mineral precipitates from the softened water stream.

6. The process of claim 1 wherein the water stream for step (a) has a temperature of at least 85 degrees Celsius and not more than 100 degrees Celsius.

7. The process of claim 1 wherein step (a) includes addition of carbon dioxide gas or sodium carbonate as a source of carbonate for precipitating calcium carbonate.

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8. The process of claim 1 wherein the CO₂ can be a slipstream of the treated flue gas.

9. The process of claim 1 wherein the alkali precipitating agent is a combination of excess ammonia and magnesium oxide.

10. The process of claim 1 wherein in step (a) the pH of the water stream is raised to at least 8.5.

11. The process of claim 1 wherein in step (a) the pH of the water stream is raised to at least 9.3.

12. The process of claim 4 wherein the treated water stream has a pH of at least 6.8 and not more than 7.2.

13. An integrated water treatment and flue gas desulfurization process comprising:

(a) subjecting produced water containing hardness minerals and recovered from an underground reservoir in a steam injection bitumen recovery operation to a water treatment process using an alkali agent selected from the group consisting of ammonia, aqueous ammonia, and sodium hydroxide, and any combination thereof to precipitate the hardness minerals and to produce a softened alkaline water stream; and,

(b) utilizing the softened alkaline water stream to scrub a flue gas containing sulfur dioxide to produce a sulfur-lean flue gas and a treated water stream rich in sulfite/bisulfite for steam generation and underground steam injection.

14. The process of claim 13 wherein step (a) includes a separation process to separate mineral precipitates from the softened water stream.

15. The integrated water treatment and flue gas desulfurization process of claim 13 wherein step (a) includes the addition of magnesium oxide for silica removal.

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16. The process of claim 13 wherein step (a) includes the addition of carbon dioxide or sodium carbonate to enhance the precipitation of hardness minerals.